

Influence of dynamic loading induced by free fall ball on high-performance concrete slabs with different steel fiber contents

Ahmed K. Al kulabi* and Ali A. Al zahid

Department of Civil Engineering, University of Kufa, Kufa-Najaf, 54001, Republic of Iraq

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Abstract. One way to provide safe buildings and to protect tenants from the terrorist attacks that have been increasing in the world is to study the behavior of buildings members after being exposed to dynamic loads. Buildings behaviour after being exposed to attacks inspired researchers all around the world to investigate the effect of impact loads on buildings members like slabs and to deeply study the properties of High Performance Concrete. HPC is well-known in its high performance and resistance to dynamic loads when it is compared with normal weight concrete. Therefore, the aim of this paper is finding out the impact of dynamic loads on RPC slabs' flexural capacity, serviceability loads, and failure type. For that purpose and to get answers for these questions, three concrete slabs with 0.5, 1, and 2% steel fiber contents were experimentally tested. The tests results showed that the content of steel fiber plays the key role in specifying the static capacity of concrete slabs after being dynamically loaded, and increasing the content of steel fiber led to improving the static loading capacity, decreased the cracks numbers and widths at the same time, and provided a safer environment for the buildings residents.

Keywords: impact load; flexural capacity; steel fiber; serviceability load; failure pattern

1. Introduction

High-performance concrete can be categorized from other types of concretes by its distinctive properties and constructability. HPC is produced from normal weight concrete with adding other ingredients that make the speciality to it and let it the only suitable for unique engineering requirements (Chen *et al.* 2016, Vinayagam 2012). It can be made from using the same ingredients of conventional concrete with changing the material proportions. Also, it can be produced by altering the way of mixing the ingredients, replacing the way of placing, and modifying the way of curing that are usually followed with the conventional once. In addition, HPC can be developed from adding other ingredients to the conventional concrete, such as flyash, steel fiber, calcined clay, etc.

HPC possesses many properties that make it attractive to be used instead of conventional concrete in many applications. Firstly, the strength of HPC is higher than that of traditional ones, the strength of conventional concrete is less than 50 MPa while the strength of HPC is about 50

*Corresponding author, Assiatant lecturer, E-mail: Ahmedk.kadhim@uokufa.edu.iq

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